MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

BMT 1014 – MANAGERIAL MATHEMATICS

(All Sections / Groups)

30 MAY 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages, including a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1[Total =25 marks]

a) A shoe company will make a new type of shoe. The fixed cost for the production will be RM24,000. The variable cost will be RM31 per pair of shoes. The shoes will sell for RM100 for each pair. What is the profit if 600 pairs are sold?

[6 marks]

b) For the following supply and demand curves, find the equilibrium point. Round the answer to two decimal places.

Demand: $p=\frac{5}{x}$, Supply: $p=\frac{x}{4}$

[6 marks]

c) Use graphical methods to solve the linear programming problem:

Maximize $z=6x+7y$

subject to:

$$2x+4y\leq 8$$
$$2x+2y\leq 7$$
$$x\geq 0$$
$$y\geq 0$$

[13 marks]

Question 2[Total =25 marks]

a) What is the accumulated value if RM2000 is invested for 8 years at interest rate 9% compounded semiannually?

[5 marks]

b) In order to purchase a home, a family borrows \$70,000 at 12% for 15 years. What is the monthly payment?

[6 marks]

c) If \$300,000 is to be saved over 25 years, how much should be deposited monthly if the investment earns 8% interest compounded monthly?

[6 marks]

d) The total cost in dollars of producing x lawn mowers is given by $C(x)=(5x+3)(7x+4)$

(i) Find the marginal cost function, $C'(x)$ [4 marks]

(ii) Find the marginal cost at $x=20$ [2 marks]

(iii) Interpret the result in (ii) [2 marks]

Continued...

Question 3 [Total =25 marks]

a) Find the derivative of the function $f(x) = \frac{2x-7}{3x-2}$ at x = 2. [6 marks]

b) For the function $y = 2\sqrt{x} - 3\ln x$:

(i) What is the slope of tangent to line $y = 2\sqrt{x} - 3\ln x$ at $x = 1$? [4 marks]

(ii) What is the value of y if $x = 1$? [2 marks]

(iii) Write the equation of the line tangent to the graph of $y = 2\sqrt{x} - 3\ln x$ at $x = 1$. [4 marks]

c) A company uses TV and magazines for advertising. They know that profit P is related to the amounts x spent on TV and y spent on magazines by the equation $P = 48xy - 6y - 3x + 4$ where P, x, and y are in hundreds of thousands. Find the maximum profit. [9 marks]

Question 4[Total = 25 marks]

a) The productivity of a major manufacturer of microwave ovens is given approximately by the Cobb-Douglas production function $P(x, y) = 27x^{0.3}y^{0.7}$ with the utilization of x units of labour and y units of capital. If the company is currently utilizing 4500 units of labour and 2000 units of capital, find the marginal productivity of labour and capital. [8 marks]

b) Find the integral.

(i) $\int (5e^x - \frac{1}{x})dx$ [3 marks]

(ii) $\int x^2\sqrt{x^3 + 10}dx$ [4 marks]

(iii) $\int (5 + x^3)(4 - x^2)dx$ [4 marks]

c) Find the cost function if the marginal cost function is $C'(x) = 14x - 3$ and the fixed cost is \$11. [6 marks]

End of paper

Summary of Principal Formulas and Terms

Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
(ii) Accumulated amount, $A = P(1 + rt)$

Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \frac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

Effective Rate of Interest

$$r_{eff} = \left[1+\frac{r}{m}\right]^n - 1$$

Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)

Basic Rules of Differentiation

a) Product rule: $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$

b) Quotient rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

c) Chain rule: $g[f(x)] = g'[f(x)]f'(x)$

d) General Power rule: $\frac{d}{dx}\left[f(x)^n\right] = nf(x)^{n-1}f'(x)$

e) Logarithmic function: $\frac{d}{dx}(\ln u) = \frac{1}{u}\left(\frac{du}{dx}\right)$

f) Exponential function: $\frac{d}{dx}\left(e^u\right) = e^u\frac{du}{dx}$

Basic Rules of Integration

a) Logarithmic function: $\int \frac{1}{u}\,\mathrm{du} = \ln \mathrm{u} + \mathrm{C}$

b) Exponential function: $\int \mathrm{e}^{\mathrm{u}}\,\mathrm{du} = \mathrm{e}^{\mathrm{u}} + \mathrm{C}$

Determining Relative Extrema

$$D(x, y) = f_{xx}f_{yy} - (f_{xy})^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y)
If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y)
If $D < 0$, (x, y) is neither maximum nor minimum point
If $D = 0$, the test is inconclusive